

Small Linux Cluster Workshop:

Cluster Configuration

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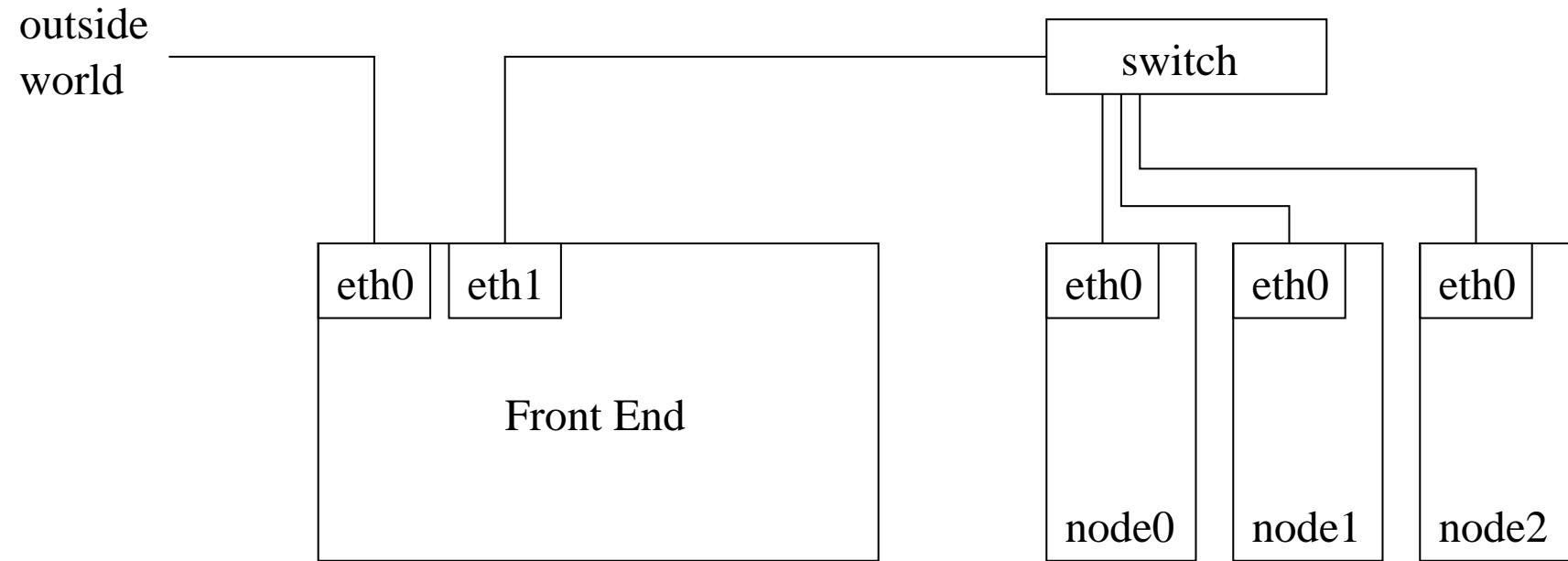
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Front End Configuration

- Network
 - System Files
 - Interfaces
 - Routing
- Services
 - DHCP - Dynamic Host Configuration Protocol
 - NFS - Network File System
 - NTP - Network Time Protocol
- Kernel Customization
 - Configuration
 - Building
 - Installation

Network - Diagram



Network - System Files

- **/etc/fstab** - File System Table
 - Static information about file-systems
 - Defines mount points for logical file-systems

related

fsck, e2label, mount, umount

- **/etc/hosts** - Static Host Name Look-up Table
 - Associates host and domain names with ip addresses
- **/etc/(passwd, shadow, group)** - User/Group Authentication
 - Specifies user's home, shell, identity, password, and group membership

related

passwd, useradd, chsh

Network - Interfaces

- **/etc/sysconfig/ifcfg-ethX** - Interface configuration script
 - Specifies device, ip address, netmask, boot protocol, etc...
 - One script per interface to be configured

example: /etc/sysconfig/ifcfg-eth0

DEVICE=eth0

IPADDR=10.0.0.1

NETMASK=255.255.255.0

BOOTPROTO=static

ONBOOT=yes

related

ifconfig, /etc/rc.d/init.d/network, /etc/modules.conf

Network - Routing

- **Route** - Static path to network or host
 - Determines which interface is used
 - Defines default route to a network or host
 - Most routes are automatically configured by the ifup script

example: Routing Table

```
% route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref Use Iface
outside-host    *               255.255.255.255 UH        0      0    0 eth0
10.0.27.0       *               255.255.255.0   U         0      0    0 eth0
10.0.0.0         *               255.255.255.0   U         0      0    0 eth1
127.0.0.0        *               255.0.0.0       U         0      0    0 lo
default         gw-outside    0.0.0.0        UG        0      0    0 eth0
```

related

route, ifconfig, netstat

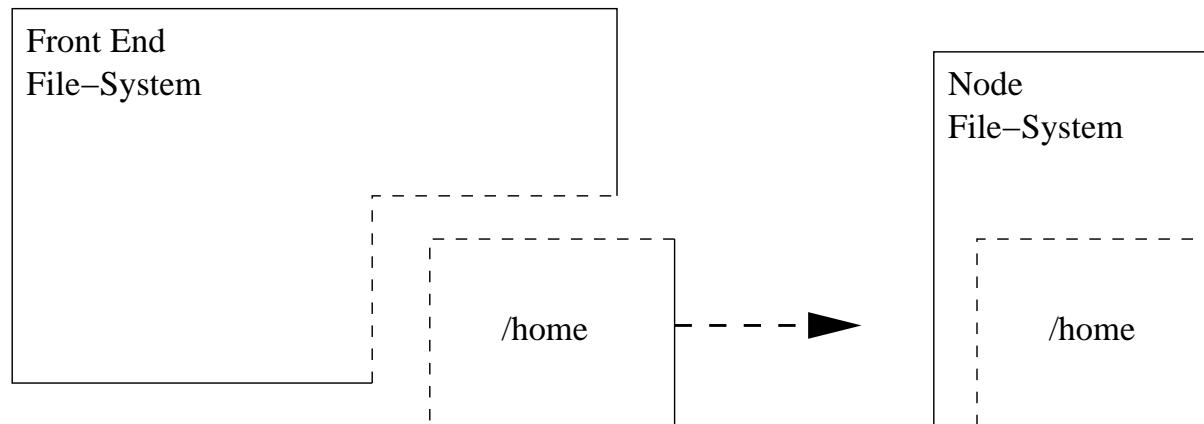
Services - DHCP

- **DHCPD** - Dynamic Host Configuration Protocol Server
 - Allows nodes to request and be assigned an ip address
- **/etc/dhcpd.conf** - DHCPD Configuration File
 - Defines subnets to serve, lease time, client identification, client address

related

/etc/rc.d/init.d/dhcpd, dhcpcd, pump

Services - NFS



- **NFS - Network File System**

- Exported file systems may be mounted by nodes
- Access is granted in /etc/exports

example: /etc/exports

```
/home      siam0?(rw)
/vendor    *.lanl.gov(ro)
```

related

exportfs, /etc/rc.d/init.d/nfs, /etc/rc.d/init.d/nfslock

- **NTP** - Network Time Protocol
 - Time synchronization with a trusted time source
 - Synchronization with multiple servers
 - Synchronization levels (stratum 1 vs. stratum 2)
- **Configuration Files**
 - /etc/ntp.conf
 - /etc/ntp/step-tickers
 - /etc/ntp/drift

related

ntpdate, ntpq

Kernel Customization

- **Configuration**

- Kernel source (ftp.kernel.org)
- "make menuconfig" (curses based)
- "make xconfig" (X windows based)

- **Building**

- Kernel image (zImage vs. bzImage)
- Kernel modules

- **Installation**

- Creating a backup
- "make bzlilo"
- /etc/lilo.conf

related

make, lilo, depmod, lsmod, insmod, rmmod

Node Configuration

- Basic Configuration
 - System Files
 - Host Access (ssh, rsh)
 - User Access

- Enhancements
 - OS Updates
 - Channel Bonding
 - Gigabit Ethernet

Basic Configuration - System Files

- **/etc/fstab** - File System Table

ks.cfg:

```
mv /etc/fstab /etc/fstab.local
cat /etc/fstab.local /path/fstab.network > /etc/fstab
```

- **/etc/hosts** - Static Hostname Look-up Table

ks.cfg:

```
cat /path/hosts.local /path/hosts.network > /etc/hosts
```

- **/etc/(passwd, shadow, group)** - User/Group Authentication

ks.cfg:

```
cp /path/(passwd, shadow, group) /etc/(passwd, shadow, group)
```

Basic Configuration - Host Access

- **/etc/ssh/ssh(d)_config** - Secure Shell Configuration
 - Configuration data for ssh/sshd
- **/etc/hosts.equiv** - Trusted Access Control File

example /etc/hosts.equiv:

guero-local

siam00

siam01

siam02

siam03

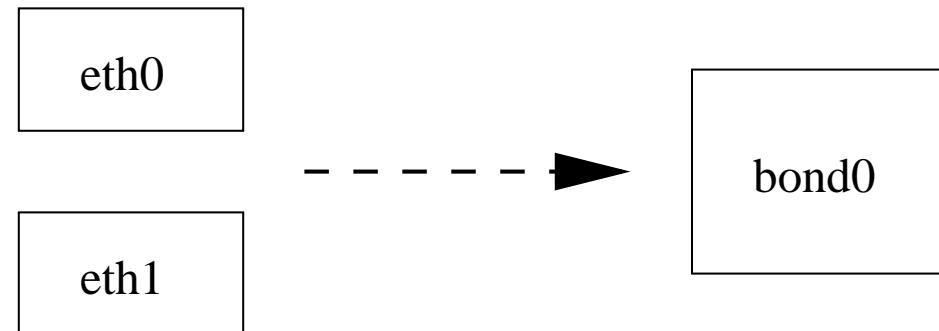
Basic Configuration - User Access

- **/etc/xinetd.d/(rsh, rlogin)**
 - User access without authentication
- **/home**
 - Export (rw) for program output
- **master.bashrc, master.cshrc**
 - Global shell configuration

Enhancements - OS Updates

- **RPM** - Redhat Package Manager
 - Standard placement of resources/programs
 - Easy to upgrade/update packages
 - Clean removal of packages
- **updates.redhat.com**
 - Updated rpms posted under revision, e.g. 7.1/os/i386
- **Script** - allows for custom application of rpm updates
 - Apply all rpms in a specified sub-directory or all sub-directories

Enhancements - Channel Bonding



- **Channel Bonding** - multiple physical devices, single logical interface
 - Increased Bandwidth vs. Higher Latency
 - Mature feature
- **Configuration**
 - Kernel module
 - /etc/conf.modules
 - /etc/sysconfig/network-scripts

Enhancements - Gigabit

- **Gigabit Ethernet** - really fast ethernet
 - Kernel support for some cards
 - High bandwidth, e.g. 600Mbps on 32bit/33MHz PCI bus
 - Becoming less expensive